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ABSTRACT

This booklet is prepared to help teachers from different disciplines to set goals and to design teaching/learning experiences that span two or more disciplines. Interdisciplinary studies provide students with opportunities and skills to synthesize seemingly disparate facts or events for greater understanding of human concerns. Three specific goals are identified for the reader: (1) to identify opportunities for interdisciplinary planning of programs or exercises; (2) to design interdisciplinary programs, exercises, or courses of study; and (3) to locate additional resources, as required, which will facilitate the prior two objectives. Five chapters cover the following subjects: (1) definitions of interdisciplinary; (2) the pivot discipline; (3) changing the curriculum; (4) teachers as individuals and as team members; (5) objectives and evaluation. A bibliography is included. (JD)

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THE HUMANITIES SERIES

DESIGNING INTERDISCIPLINARY STUDIES PROGRAMS

A PROJECT SEARCH DEVELOPMENT

The University of the State of New York
The Board of Regents
Albany, New York 12234
1976

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Foreword to the Humanities Series

DESIGNING INTERDISCIPLINARY STUDIES PROGRAMS has been prepared to help teachers from different disciplines (plus consultants and students where feasible) to set goals and to design teaching/learning experiences that span two or more disciplines. Interdisciplinary studies provides students with opportunities and skills to synthesize seemingly disparate facts or events for greater understanding of human concerns.

The need to humanize education defines a vital educational goal. Few schools have succeeded in developing learning environments humanistic in process, in content, or in perspectives. The Humanities Series addresses aspects of concerns related to the value commitments open to each individual and to the consequences such choices have on the individual and on others. Contemporary humanities education seeks to achieve its objectives in four categories of student behavior.

Project SEARCH, a consortium of school districts in New York State (1971-75) developed in-service staff programs, curricula, and student learning experiences based on these four objectives. Several titles in the Humanities Series incorporate outcomes of Project SEARCH. The objectives are:

1. *Reasoning:* If the freedom of man consists in determination of his choices by factors within himself, we often say that it is man's intelligence or reason which governs his purposive activity. Reasoning means the individual can modify her or his conduct to meet new situations. The person can not only change, but grow. Each one can profit from past experience. Each can become responsible.

2. *The Affective Domain:* Education has long concerned itself with the cognitive, with knowledge--as if there were only one kind of knowledge, factual data. However, a complementary aspect of knowledge, each person's affective powers, can deter or enhance his cognitive development. How a girl or boy, woman or man feels about wanting to learn, how she or he feels as each learns, what each feels as he learns, and what each feels after learning--these lie in the affective domain. These neglected aspects, the vital area of attitudes and personally held values, form an integral concern of the humanizing learning process. Such self-awareness helps the possessor cope with change.

THE HUMANITIES SERIES

The Humanities Series addresses essential aspects of contemporary humanities education, a process-oriented approach to human concerns, adaptable to varied content areas. The Humanities Education Unit personnel, responding to the growing demands of humanities educators in the schools, developed the series to provide rationales, flexible guidelines, and appropriate skills to meet the needs of students, kindergarten through grade 12, in an age of change.

HUMANE LIFE-COPING SKILLS

THE HUMANITIES STRAND OF PROJECT SEARCH

CRITICAL THINKING AND REASONING: A Handbook for Teachers*

DESIGNING INTERDISCIPLINARY STUDIES PROGRAMS*

VALUING: A Discussion Guide*

DEVELOPING INSTRUCTIONAL OBJECTIVES FOR HUMANITIES PROGRAMS*

HUMANITIES EXPERIENCES AT NEW HARTFORD: Student-Produced Films*

INSERVICE APPROACHES FOR HUMANITIES EDUCATION*

HUMANITIES EDUCATION: A Planning Guide

AESTHETICS OF FILM AND TELEVISION

VALUES: Simulations for the Classroom

PROJECT SEARCH EVALUATION*

*Project SEARCH Developments, with support from the JDR 3rd Fund and Title III of the Elementary and Secondary Education Act. Project SEARCH, a pilot consortium of school districts across New York State, 1971-75, implemented the major objectives of contemporary humanities education.

3. *Interdisciplinary Learning*: Fragmentation of learning, the separation of disciplines into isolated compartments, too often leaves even the able student frustrated. Knowing many facts, the learner still understands neither the interrelationships between disciplines nor their personal and social significance. The curriculum envisioned by humanities education integrates the arts; the physical, social, and behavioral sciences; and other disciplines, pursuits, and circumstances whenever such interdisciplinary instruction and experiences contribute to a whole life view.

4. *Values*: The basic values which undergird the American way of life and which have guided the actions of people for centuries are being severely tested in an era of rapid technological change, social readjustment, and population expansion. The shattering impacts of these changes are most visible among the young. Schools, to be successful in helping young people develop values that will give them a sense of direction, must offer opportunities for students to make free choices from among alternatives.

Reasoning, affect, and interdisciplinary learning are seen as supporting the process approaches to values development. These concepts cover a very broad range of human activity. The purpose of the Humanities Series is to help teachers design student learning experiences related to these categories.

In addition, humanities education seeks to support these four objectives through three major strategies:

1. PROCESS APPROACH: Change is so rapid that no one can predict precisely what knowledge and information individuals will need to know in just a few years. Humanities education sees a compelling need to develop an educational approach based on adaptable process skills, secondarily on content. These process skills, transferable and dynamic, including the individual's perceptual, motor, affective, cognitive, and social interaction skills, will enable a student to cope with a changing world.

2. UTILIZING COMMUNITY CULTURAL RESOURCES: Any system of education which represents a marked departure from traditional learning will fail if it ignores the community's needs, resources, and aspirations. School and community must be integrally related both in planning and implementing educational change. Most adults have been educated under a system very similar to the system operating today. These adults must be involved in the

new thinking and research on the nature of learning if we are to anticipate their cooperative support. In addition, the school must view the community as what it is, an extension of the school. Such interaction between school and community which encourages free reciprocal flow of learners and instructors can result in realistic, exciting learning activities. Not only will students enter the community for learning experiences, but professionals, craftsmen, artists, farmers, retired citizens will likewise share their competencies with youthful learners within the school.

3. INDIVIDUALIZED INSTRUCTION: Humanistic education focuses on the worth of the individual, on the self-actualization of each girl or boy. Implicit in the program are varied opportunities for each student to participate in sequenced learning experiences adapted to individual capacities and responsive to individual interests. Such learning experiences can help each student discover his or her potential; challenge latent abilities; prepare each to make his appropriate, unique, and effective contribution in a changing society. The Humanities Series is dedicated to helping our youth by providing administrators and teachers with a process approach to all learning, a humanizing process which will enable our boys and girls to live not only the good life, but the life worth living.

Charles J. Trupia, Supervisor
Humanities and Performing Arts
Education Unit

Albany, New York
May, 1976

PREFACE: OBJECTIVES OF THIS BOOKLET

This booklet is designed to help school personnel in three specific ways. After completing the material, readers will be able:

1. To identify opportunities for interdisciplinary planning of programs or exercises;

2. To design interdisciplinary programs, exercises or courses of study; and

3. To locate additional resources, as required, which will facilitate the prior two objectives.

These three statements are deliberately circular. What is being said - in a somewhat less technical way - is that it is our hope that the reader of this booklet will feel more comfortable attacking the problem of (and enjoying the solution to) designing interdisciplinary materials and programs. The third objective really says that no one booklet can do the entire job of providing all the background reading and examples. More of these are referred to in the Bibliography. They are likely available within most school systems, through the State Education Department or via the ERIC Documentation centre.

How does one evaluate the success of this booklet? At least three cateria are suggested:

1. Teachers will actively seek out someone in the school or community with whom to discuss designing an interdisciplinary exercise or entire program;

2. Teachers will present some of the material in their own class in a new way - one which fits one of the definitions of "interdisciplinary" given in Chapter ! - and students will, therefore, learn in a different way, and

3. Teachers will return for at least three meetings of a group of colleagues called together to explore "interdisciplinary curricula," or "becoming interdisciplinary," or some similar title.

In many ways these three objectives have an attitude--or value--base. Achieving the first criterion would mean that a teacher had been sufficiently interested or motivated to begin a dialogue with a colleague (fellow teacher, administrator) or other resource person (artist, librarian, industrialist) that a

new program might result. Meeting the second objective would mean that a teacher had taken the standard material(s) of his or her own discipline(s) and had reorganized it or presented it in a way which can be called "interdisciplinary." The second criterion also carries the most important phrase "students will, therefore, learn in a different way." This is, of course, the ultimate goal - that something will happen for students as a result of the new program. Research indicates that what happens as a result of an interdisciplinary program is well worth the effort (9).*

The third criterion contains a message as well as a hope. Planning for interdisciplinary programs can be a very difficult social event. It suffers from all the normal difficulties of a group of specialists - jargon, vested interests, and so forth - plus the added dimensions of ambiguity and novelty. Many teachers, confronted with the initial planning stages get "turned off." Some guidelines are provided in Chapter 4 that may help teachers to stay "plugged in" and "turned on."

* * *

Designing Interdisciplinary Studies Programs was prepared for Project SEARCH by David S. Abbey, of Evaluation Research Limited, Toronto, Canada. A longtime friend and advisor to the Project, Abbey also prepared Valuing: A Discussion Guide, and Developing Instructional Objectives for Humanities Programs.

This publication was developed for Project SEARCH with the guidance of the Humanities Unit - Katherine V. King and William R. Clauss, Associates for Humanities Education.

*Numeral in parenthesis refers to numbered item in Bibliography.

CONTENTS

PREFACE: OBJECTIVES OF THIS BOOKLET.....vi

1. DEFINITIONS OF INTERDISCIPLINARY..... 1

2. THE PIVOT DISCIPLINE.....12

3. CHANGING THE CURRICULUM.....19

4. TEACHERS AS INDIVIDUALS AND AS TEAM MEMBERS.....24

5. OBJECTIVES AND EVALUATION.....29

BIBLIOGRAPHY.....36

ADDITIONAL RESOURCES.....37

I.

DEFINITIONS OF INTERDISCIPLINARY

To start, here's a brief list of terms which are used almost interchangeably in the literature in this field:

Interdisciplinary
Cross-disciplinary
Multi-disciplinary
Integrated
Poly-disciplinary

In these examples the word is used as an adjective. The noun which is modified is equally variable:

Course	Concept
Program	Exercise
Material	Lesson

The end result is a great number of combinations many of which were used in the preface, none of which differs significantly except as a question of scale. That is, an interdisciplinary exercise is a smaller curriculum unit than an interdisciplinary program.

The definitions which seem clearest and most useful have been prepared by the New York State Education Department, The Division of Humanities and Arts Education (14). These are summarized in one overall statement:

> An interdisciplinary approach to learning combines or interrelates aspects of at least two academic disciplines or subject areas.

These are some highly technical fields which, by their very names suggest that they are interdisciplinary. For example:

Political Sociology	Psychophysiology
Microbiology	Computer Graphics
Aerospace Medicine	Electronic Music
Social Psychology	Ecology
Political Geography	

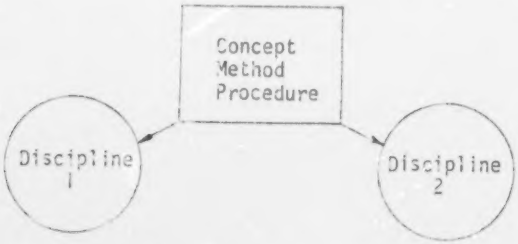
Translating this down to the level of the child's or youth's experience in the classroom, it is possible to say that almost any two disciplines can be merged in some way, or at some level, to create a new and meaningful synthesis. "Interdisciplinary" does not mean the death of individual disciplines. The teacher of English Literature needs his or her special knowledge, the social studies teacher needs his or hers. Together they can present students with data, methods of inquiry, realistic problems, and rules for drawing conclusions that are infinitely more varied and richer than could either of them alone. A corollary of this is that either of them, given the time both to learn about the other's discipline and to plan new ways of teaching, could produce a more varied and richer course than they currently teach. More of this later.

Interdisciplinary programs may utilize the content, the principles, or the procedures of two or more disciplines.

Definition 1

An interdisciplinary course or project could result from an application of the same concept, method, or procedure to the subject matter of two or more disciplines.

Figure 1



Example 1.1 Selecting a concept and viewing it within several disciplines:

(a) The concept of "cycles" can be studied in several disciplines:
- Biology - body rhythms
- Climate - rain cycles
- Botany - growth cycles

(b) The concept of "value" can be studied in several disciplines:
- Economics - money
- Philosophy - value
- Psychology - value
- Art - value

(c) The concept of "arch" can be studied in several disciplines:
- Architecture - arch as structure
- Geometry - arch as equation
- Physics - arch as load-bearing structure
- Geology - arch as result of erosion

Example 1.2 Selecting a method and seeing how it is used within several disciplines:

(a) "Inference" is a method used in:
- Logic - rules of inference
- History - inferential conclusions
- Humanities - inference about people, motivations

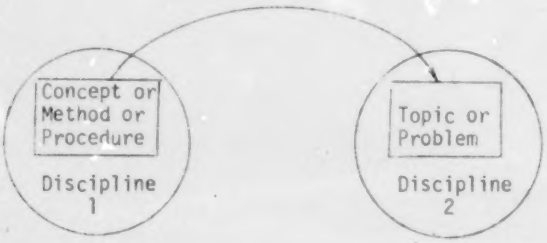
(b) "Experimentation" is a method used in:
- Physics
- Chemistry
- Psychology
- Music
- Painting

(c) "Structural analysis" is a method used in:
- Architecture
- Aesthetics
- Music

Definition 2

An interdisciplinary approach, exercise or program can result from the application of a concept, method or procedure from one discipline to a topic or problem in a different discipline.

Figure 2



Example 2.1 Applying a concept from one discipline to the problem of a second discipline:

(a) The concepts of "atom," "molecule," and "compound" can be taken from chemistry and applied to word, sentence, and paragraph structure in English.

(b) Pascal's triangle can be taken from mathematics and applied to problems of heredity in botany or genetics.

(c) The concept of dynamic tension can be taken from physics and applied to drama, painting or other art forms.

Example 2.2 Applying a method or procedure from one discipline to the problems of a second discipline.

(a) The experimental methods of physics can be applied to problems of social behavior*

(b) Methods of calculating ratios can be applied to problems encountered in music, in economics, in art appreciation, and so forth.

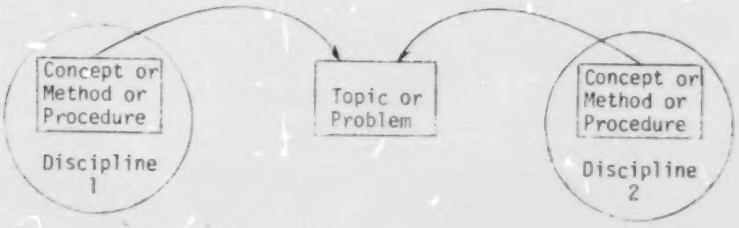
(c) Methods of assessing acidity can be taken from chemistry and applied to food chemistry, or environmental studies, or even the study of textiles.

*It is said that it "can" be applied. Whether this is appropriate or not is a good question for classroom discussion.

Definition 3

An interdisciplinary approach can be created by applying the concepts, methods, or procedures of more than one discipline to the same problem or topic.

Figure 3



Example 3.1 Applying the concepts, methods, or procedures of two or more disciplines on the same topic or problem.

This is probably the most widespread definition of "interdisciplinary." Without question the field of ecology or environmental studies provides the richest set of examples of programs which are truly interdisciplinary (10,12).

(a) Table 1 shows the ways in which mathematics and environmental studies were integrated in one such program (12).

(b) Table 2 illustrates a very complex outline for an interdisciplinary program titled, "Toward the Year 2000" - a program focussing on the skills necessary to analyze and to cope with urban life in the future (3).

Table 1

Mathematics and Environmental Studies

MAJOR CONCEPT CATEGORIES APPLICATION CHECKLIST

Subject: Mathematics Grade levels: 7 & 8 Unit Divisions	1 Sun Energy	2 Interaction of Ecosystem	3 Carrying Capacity	4 Water Supply	5 Air Supply	6 Resource Distribution	7 Influences for Change	8 Cultural, Economic Social, Political Factor	9 Manipulation	9A Short term, Long term factors	9B Individual Alterations	9C Stewardship and Rights
Properties of Whole Numbers			X	X	X			X		X	X	
Properties of Decimals			X	X				X				
Properties of Fractions			X	X				X				
Percent			X	X	X	X		X	X	X	X	
Perimeter, Area, Volume			X			X						
Informal Geometry						X						
Ancient Numeration Systems												
Other Numeration Systems												

Table 2

Outline for the Course,

"Toward the Year 2000"

UNIT	TITLE	TIME
I.	Decision-Making	4 weeks
II.	Communication	1 week plus one weekend
III.	Geography and International Simulation	5 weeks
IV.	Understanding Computer Concepts	4 weeks
V.	The Environment Crisis I.	
	A. Pollution	3 weeks
	B. Population Growth	3 weeks
VI.	Man-Machine Interaction	4 weeks
VII.	Labor-Management Simulation	4 weeks
VIII.	Urban Problems	3 weeks
IX.	The Year 2000	4 weeks

(c) At a simpler level, the following would constitute exercises which satisfy this third definition of "interdisciplinary":

- A geometry teacher and a physical fitness instructor devise a series of problems involving the shot put, or the javelin, to show how one can predict with accuracy where a missile will land;

- A music teacher, an English teacher and a history teacher pool their knowledge of the Great Depression and its music and art to set exercises for students who are concerned with analyzing today's social values and economics;

- A physics teacher and an industrial arts instructor design problems concerning structural soundness which can be solved by simulation or model building.

In Summary:

Three general definitions of interdisciplinary have been given:

1) Applying similar concepts, methods, or procedures to two or more disciplines;

2) Applying the concepts, methods, or procedures of one discipline to the topics or problems of another discipline;

3) Applying the concepts, methods, or procedures of two or more disciplines to the same topic or problem.

In each definition, application is specified. The "how to" of this is discussed in subsequent chapters.

The Value of Interdisciplinary Studies

It has been argued (2) that:

> "Cross discipline planning is beneficial to students and teachers alike. Because it forces the teachers to review and audit the curriculum, it provides a flexibility that is desirable in the structured school setting."

and that such planning works:

> "because students find that they are learning a principle in one classroom and having it reinforced in another, and the reinforcement occurs within an effective time span."

From a learning theory standpoint, the concept of reinforcement occurring soon after an experience is sound. From the learners' standpoint, such reinforcement indicates that there is an integration or gestalt to the whole learning enterprise. Transfer, generalization, and pattern learning are all enhanced. So, too, are discrimination learning and complex recognition tasks.

But there are other (less technical) ways of looking at the value of interdisciplinary studies. In a comprehensive review (9) of many interdisciplinary programs, the finding was made that:

> "...the self-concept of learners who were exposed to the interdisciplinary approaches was higher than those who were exposed to the disciplinary approaches. The former were found to be more independent, more assertive, more self-motivated, more enthusiastic, more interested and more involved than the latter."

As though these sterling outcomes were not sufficient, the author continues:

> "The former did better and used more varied approaches to problem solving. Also, they made better use of their available time."

Note, however, that "did better" does not mean that overall academic achievement was better. It refers to overall use of the school as a total learning environment, to attitudes, and, as noted, to self-concept.

It is believed that since effective interdisciplinary planning demands effective cooperation among staff, this leads ultimately to more effective interpersonal relations between staff and students. In turn, this leads to a less punitive and more supportive milieu in which the student can learn, explore, and grow.

Interdisciplinary Programs, Team Teaching, and Multi-media Programs

A word (several, in fact) needs to be said to distinguish between approaches which are truly interdisciplinary and those which arise out of cooperative efforts of two or more teachers to

work with the same group of students or those which are characterized by several ways of presenting information.

When the concepts, methods, or procedures of two or more disciplines are isolated and examined and are found to have similarities and are then presented as common denominators or as linking concepts, then the emphasis is interdisciplinary. However, when two specialists each teach their specialty in turn without examining or making their overlap explicit, then an interdisciplinary approach probably does not exist.

Furthermore, the use of a combination of media (film, text, recording, and so forth) all dealing with the same topic or problem is no guarantee of an interdisciplinary approach. While each medium treats the topic in its own way, it is necessary to isolate and to focus on the similarities and differences across media in order for the student to achieve the real benefit of multi-media presentations.

This does not mean that various media - each from a different discipline - should not be used concurrently to illustrate a common point. On the contrary, excellent results can be achieved such as in Carl Jung's Man and His Symbols. On two pages, for example, illustrations are drawn from 16th century Chinese opera; a sixth century B.C. Greek jar; a 19th century film (Charlie Chaplin's 1936 film Modern Times). The concept being dealt with is the "trickster," a hero who "is instinctual, uninhibited, and often childish." The message is clear and the approach is clearly interdisciplinary (8).

Interdisciplinary Studies and Valuing

Because "interdisciplinary" means that traditional academic boundaries are broken (or at least made porous), then the programs and exercises which result can benefit in several ways:

1. More problems present themselves to the student, he/she becomes aware that every attempt to force reality into a discipline creates unanswered questions, he/she becomes aware that many perceptions and problems can be questioned - they are not necessarily the "givens" of the world;

2. More alternatives as explanations or solutions to problems are typically available to the student;

3. More methods are available to the student to analyze the consequences of particular choices or courses of action;

4. More (and more complex) criteria are available to the student who experiences interdisciplinary courses;

5. More techniques are available to the student to conduct tests, to experiment, to validate his or her choices or hypotheses;

6. More substantial rules of evidence and more flexible means of re-evaluating his or her choices are available to the student.

These statements say in effect, that the sixfold process of valuing is enhanced through exposure of the student to the richness of interdisciplinary thought and method. Perhaps it is this factor which contributes to the increased self-esteem which is reported for students of interdisciplinary programs.

A long quote from the page of the Teachers' Manual for use with "Searching for Values: A Film Anthology" will show how this series and its exercises are intended to contribute both to a sense of self and to an appreciation of values:

"Aims of the Series

1. To provide compelling, dramatic narratives which will excite students to discuss the values, conflicts and decisions of the characters, as well as broader themes and issues.

2. To provoke students to recognize and question their own values, attitudes, and goals, those of society, and of other cultures.

3. To engage students in a deeper search for self-awareness by focusing on psychological motivations, interpersonal relationships, and the role of the individual in society.

4. To give teachers of English, humanities, social studies, and film, as well as guidance counselors and religious leaders, vivid case-studies that can be approached from many angles, and used for various thematic units and courses of study." (15)

2.

THE PIVOT DISCIPLINE

These are two basic ways of conceptualizing the disciplines to be integrated. First, they can be viewed as points on the circumference of a wheel with the spokes of the wheel indicating connections among the disciplines and the circumference indicating a theme, or storyline which serves to connect the disciplines in some orderly fashion. The second view differs in only one respect from the first view, but it is critical. In this picture, a single discipline is placed at the hub or pivot of the wheel. From this position, at the center, the other disciplines can be coordinated, integrated, and reinforced (2).

There are, of course, differences in these two approaches which are more than visual or conceptual. In the second, the discipline at the hub is active in a leadership capacity. To say that it coordinates, integrates, and reinforces the other disciplines means that it is obviously in a leadership role. The implication of this is that the teacher or teachers associated with the pivot discipline will be in a different relationship to the other disciplines than one of equality. In this view of organizing and planning for interdisciplinary studies,

> "The teacher of the pivot discipline acts as the chairman of the planning meeting(s) and has the responsibility of conveying to the other teachers those things which he or she intends to do in the pivot discipline and those relationships which exist that can be reinforced by the other disciplines" (2).

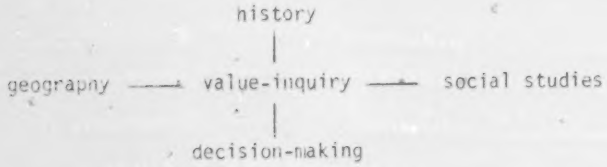
This is an extreme statement for it suggests that the teacher(s) of the pivot discipline diagnose, define and decide on the interdisciplinary relationships which are to be taught. While the notion of a pivot discipline as coordinator is worthwhile and should be followed, this should not be taken to mean that all of the power and decision-making is automatically centralized at the hub. As we will see later, leadership and teamwork will be required for effective planning. The concept of the pivot discipline is vital to this planning because it provides a ready-made frame of reference. The frame may be badly scarred or even demolished by the time the team gets through, but it is needed as something against which to react or around which others can be creative.

Example 1:

(a) The following disciplines (or sub-disciplines) can be brought together in a number of ways:

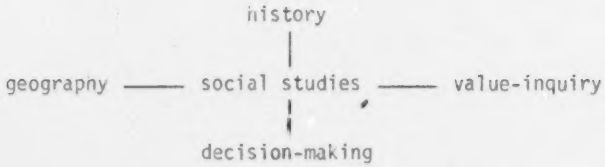
value-inquiry
history
geography
decision-making
social-studies

Consider the following arrangements, each with a different pivot discipline at the centre:



This might be a course or series of exercises in which the focus and methodology revolved around value-inquiry. Values might also be viewed historically and as a product of different geographic and social environments. Also, the ways in which different people approach decisions about life problems (i.e., communal, authoritarian, democratic and so forth) and how this is related to and supported by values could be demonstrated. Students from different ethnic or regional backgrounds could view their own values and those of their parents within such a program.

(b) The wheel could be altered by interchanging "value-inquiry" with "social studies."



This could lead to a program of studies in which regional, national, or international events became the primary focus, supported by concepts from the other four disciplines. Thus, questions of integration or busing or welfare might be examined with input concerning regional disparities (geography), previous custom and legislation (history), locus of moral and/or legal responsibility (values), and means of allocation of resources such as taxes (decision-making). And so it goes...

A different pivot creates a different teaching and learning experience.

Example 2: Environmental studies can be approached from a vast array of disciplines at the pivot. One interesting one is the use of language or communications (10):

> "The communicative arts (including the 'fine arts') offer the student a way of recording and transmitting his perceptions of the environment - how it appears in the present, what it might have been like in the past, or what it might become in the future" (10).

Table 3 indicates the types of student activities which might result with this discipline at the hub. These are clearly different exercises from those which might occur had botany or zoology been selected as the pivot.

Table 3

Student Activities for Interdisciplinary Environmental Education (Language as the Pivot Discipline)

KIND OF UNIT OR SEQUENCE OF ACTIVITIES	LEVEL	ACTIVITIES	
		DISCURSIVE	NON-DISCURSIVE
1. Study of endangered species.	Elementary	Student tries to discover as much information as he can about a particular endangered species. He prepares a dossier on the animal, pastes pictures, writes or dictates a history of the animal.	Student invents an imaginary endangered species, draws its picture, tells or writes of its demise, and so forth.
		Class prepares a book containing dossiers and mounted pictures of various endangered species, real and imaginary.	
		Class writes and enacts an original play about endangered species, featuring real and imaginary animals.	
2. Study of pollution featuring a field trip in which some local problem is observed by children.	Elementary	Children keep journals of field trip, recording their observations, or they photograph the setting in order to prepare a photo essay of the trip.	Children compose creative responses to situation (verse, short narratives, montages, and so forth).
		Children write letters to local officials or environmental experts expressing concern over the conditions and questioning what might be done to change the situation.	
		Class prepares newsmagazine containing picture essays, journal entries, letters, and other creative pieces (all dealing with local problem or pollution generally).	

Table 3 (cont'd)

KIND OF UNIT OR SEQUENCE OF ACTIVITIES	LEVEL	ACTIVITIES	
		DISCURSIVE	NON-DISCURSIVE
3. Study of the affects of advertising on shaping attitudes and behavior toward the environment.	Secondary	Student prepares a folder of ads which might contribute to environmental damage (directly or indirectly). Students write letters to corporate heads, telling of the ill effect their company's advertising might be having on the preservation of the environment. Students prepare an advertising campaign (resorting to the persuasive techniques of an ad man, using all media) which attempts to reveal the potential ills of national advertising. The campaign could be presented to the public.	Students prepare an original counter-ad (printed, illustrated, taped, filmed) designed to alert the public to the environmental ills which can be attributed to a particular company's products or services.
4. Study of unplanned development of local land.		Students prepare an ecological survey of a local land area due to be developed, including water, soil, plant, and wildlife analysis.	Students design and construct a model of the kind of development which would be feasible in such an area including homes, businesses, parks, and recreation areas.

Example 3: Many teachers, both individually and collectively are concerned about their students' self-concept. Any of the following might be used as a pivot discipline in an interdisciplinary study of this problem:

> Art - man's attempts to represent himself graphically (viz, Picasso, Rembrandt, Chagall, Dali, and so forth)
>
> Music - use of lyrics and instrumentation to express feelings and problems as well as to portray life dramas. Consider the contemporary lyrics of Neil Diamond, Helen Reddy, Elton John as well as the more "classical" statement in an opera.
>
> Social Studies - literature and studies relating use of drugs to self-concept; relation of self-concept to aggressive acts, crime, and so forth
>
> Literature - man's attempts to see himself in relation to universals; effects of ideologies and dicta on self-concept.

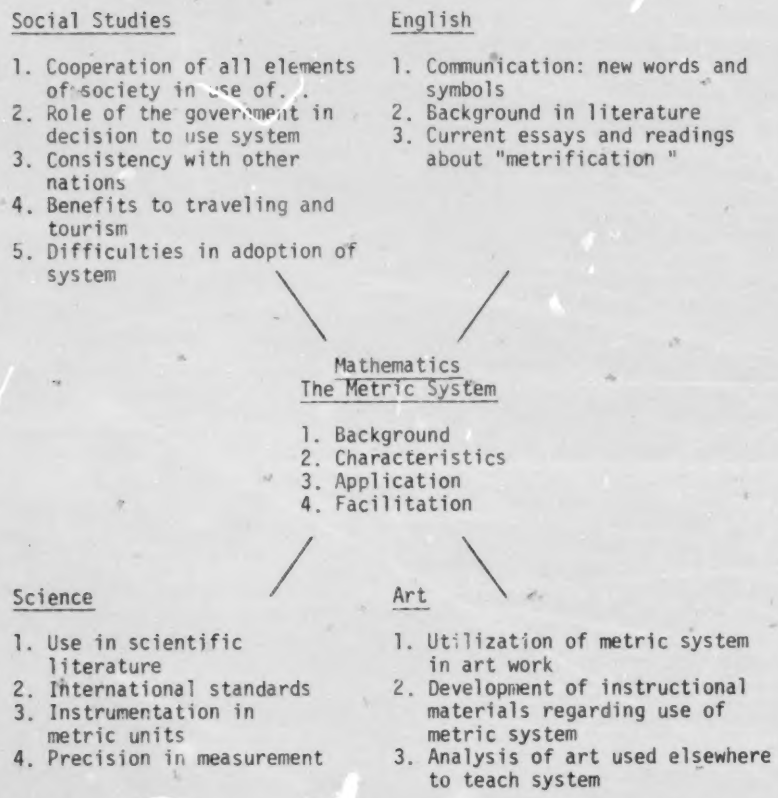
Which of these might be the pivot discipline? Any of them? Yes. It would be stimulating to students in a course that asked them to consider the possible relations between man's idols, buildings, art, etc., and his view of himself; or which looked at statements of changes in values, family structure, social status, and indices of mental health as reflections of self-concept.

Example 4: Table 4 illustrates the interaction of five disciplines: mathematics (the metric system) at the hub and around it social studies, English, science, and art. According to the authors of this example (2).

> "If the pupil is taught the metric system as another facet of mathematics, he will fail to see the broad impact that this expression of measurement will have throughout the nation."

Table 4

Illustration of Use of a Pivot Discipline*


Social Studies
1. Cooperation of all elements of society in use of. .
2. Role of the government in decision to use system
3. Consistency with other nations
4. Benefits to traveling and tourism
5. Difficulties in adoption of system
English
1. Communication: new words and symbols
2. Background in literature
3. Current essays and readings about "metrification "
Mathematics
The Metric System
1. Background
2. Characteristics
3. Application
4. Facilitation
Science
1. Use in scientific literature
2. International standards
3. Instrumentation in metric units
4. Precision in measurement
Art
1. Utilization of metric system in art work
2. Development of instructional materials regarding use of metric system
3. Analysis of art used elsewhere to teach system

*Adapted from (2).

3

CHANGING THE CURRICULUM

Shifting to an interdisciplinary approach may give rise to a number of problems or it may not. A great many teachers are already engaged in interdisciplinary studies as defined here. For them, for their administration, and for their students, an explicit commitment to interdisciplinary planning and teaching may cause little difficulty. On the other hand, there are a number of problem areas which should be recognized by anyone moving into this area for the first time (or by someone contemplating returning to it).

1. Personnel Problems

From interviews with many teachers, program planners, and administrators of interdisciplinary programs,* it appears as though **interpersonal** cooperation is a primary requirement for success. Not only do the participating teachers need to find a way of working together successfully, but they need the understanding, cooperation, and support of their administration and their supervisors. Moving into an interdisciplinary mode requires a great deal of time. Teachers report working - enthusiastically - on their own time, but this ought not to be the rule. Those who chose to embark on this type of teaching need the involvement of the administration to further the latter's understanding of what's going on. They also need

*The primary reference for this chapter is (13).

his or her understanding in order to secure released time for project meetings as well as other resources. If the team works in a cooperative social environment, then these attitudes are communicated to the students as part of the total package. The opposite is equally true.

Another personnel problem is the very real reluctance or blocking which some teachers feel in giving up traditional ways of teaching. Their favorite texts, examples, exercises, and stories all become potential victims of the new process. It is obvious that each teacher may also learn a great many new facts, be exposed to new materials and techniques, and discover more depth in his or her discipline. At the outset, though, the negative feelings - which have the quality of separation anxiety - outweigh these other potentially positive outcomes.

Finally, we should note the hard reality that "Teachers frequently have not been sufficiently prepared and oriented to deal with interdisciplinary studies" (13). The relationships which are dealt with are complex and include "man and his environment, interrelationships among the disciplines, and those between man's work, his existence and his environment" (13). Not all teachers want to operate at this level. It is a complex question of ability and motivation. Those who want to work in this way should expect some resistance from others with whom they want to work. The resistance should be carefully analyzed and discussed openly on a one-to-one basis if possible.

2. Curriculum Content

One of the reasons for advocating interdisciplinary studies is that it reduces the fragmentation produced by artificially separating human experience into specialized fields or disciplines. The teachers of the pivot discipline interacting with those of the other supporting disciplines can serve to avoid the artificial while stressing the unity of experience. Unfortunately, those involved in the "supporting" disciplines may feel inferior or second-best. Hopefully, the goal of planning can be seen as the education of the students, not the creation of a new hierarchy of departments in the school.

If the planning process suggests bringing in community resources such as artists, politicians, parents, and so forth, it should also make provision for pre- and post-experience teaching and exploration. The "one-shot" experience of an

expert who parachutes into the middle of an ongoing curriculum does less for the student than a discussion of the relevance of this expert's expected contribution prior to his or her arrival, followed by an evaluation and synthesis of the contribution actually made.

Another potential source of difficulty occurs in the transition phase. It is a difficulty for both staff and students. The former may find themselves teaching in two different ways with different social contacts in the school for each while the student finds that there are different levels of complexity, or different kinds of objectives, or different amounts of resources available in the new approach as compared with the old one. This is a problem which can be handled best by open discussion and periodic evaluation by all parties of the similarities and differences between the two approaches and of the perceived benefits (or lack) of the new approach in contrast to the old one.

3. Community Program Relationships

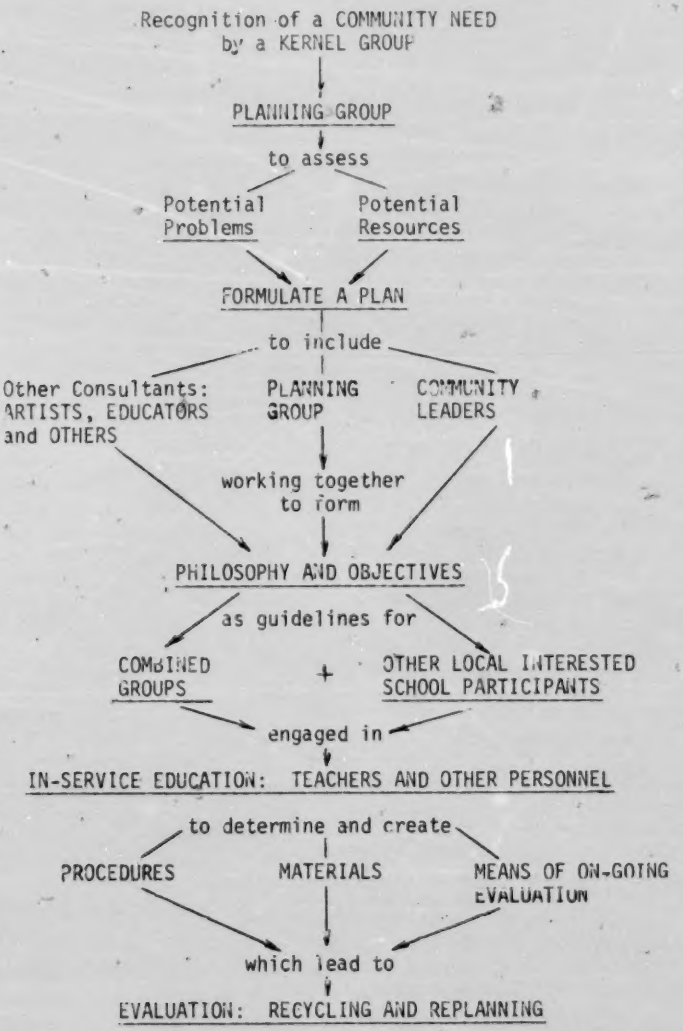
While some interdisciplinary programs may be conducted wholly within the school with no visible signs to the "outside world" that a change in planning and procedures has occured, this is not so for many programs. A sufficient excitement is generated in some schools that the planning process and the use of resources becomes highly visible. Parents, industry, libraries, mass media, universities may all find themselves being involved for the first time or may discover that they are being asked for involvement in new and typically more intense ways.

Figure 1 (13, Fig. 1) illustrates a model for beginning an interdisciplinary program which starts from the recognition of a community need. Not every program will begin this way, but many successful ones have. Even for those which do not, it is useful to scan the figure to note that any program could expand to use this wide range of participants.

Community involvement can obtain support; it can also offer sobering demands and confrontation. When programs challenge local and traditional ways of doing and believing, the teachers responsible will need representatives of the community on the planning team - not only to anticipate such confrontations, but also to prepare the counter-arguments which may be needed to guarantee the rights of the students to this type of education.

Figure 1

A MODEL FOR BEGINNING AN INTERDISCIPLINARY PROGRAM*



*Taken from (13).

Summary

This booklet is written with an intent to motivate teachers to move into interdisciplinary studies. As a summary to this chapter on curriculum change, a set of recommendations are quoted (7) for the benefit of curriculum planners and funding agencies "who might be interested in fostering curriculum change." It is believed that these recommendations provide a useful bridge between what has been already said here and the discussions of team work and objective-setting which follow:

> "1. Any new curriculum model should allow sufficient lead time in planning so that all persons involved are oriented to the purposes of the program. Communication among consultants, resource teachers, classroom teachers, and administrators must be established at the outset of the program and maintained throughout if it is to be maximally effective.
>
> 2. The planning for change should be done cooperatively by those who will be involved. Particular care should be taken to see that teachers do not feel change is being forced upon them. They must feel that they are the ones bringing about changes which they want made.
>
> 3. Goals of curriculum change must be stated in terms which can be operationalized. Even with the realization that the developing of innovative curricula should accommodate a certain amount of trial and error, the need for change and the direction in which a new curriculum is to move should be stated in as precise a manner as possible. In this age of accountability, vague and meaningless goals and objectives can no longer be accepted.
>
> 4. Planners of change should consider carefully alternative approaches for effecting change. Factors affecting the appropriateness of certain approaches are many and complex. In particular, strategies for utilizing the various inservice models must take into account many factors, e.g., socio-cultural makeup of the community, economic resources, perceived needs of the students, a school's organization, teachers' strengths and weaknesses, and so forth.
>
> 5. For greatest "payoff" in terms of change, planners of new curricula would do well to focus initially on change in the affective domain. Once administrators and teachers become committed to new ideas or ways of teaching, the follow-through implementation will be accomplished with relatively little difficulty."

4

TEACHERS AS INDIVIDUALS AND AS TEAM MEMBERS

1. The Teacher as an Individual

Chapter 3 outlines some of the problems and challenges likely to be encountered by teachers of interdisciplinary studies. In considering teaching in this way, it would be well to look at what actually happens in many programs for this may be a guide to the demands which will confront the individual teacher. Purcell, in her study of interdisciplinary arts and humanities programs, asked for completion of the following: "The central emphasis of the program is in..." Her results (13) indicate the following:

Table 4

Central Emphasis of Interdisciplinary Programs in Arts and Humanities

Central Emphasis	Frequency of reply
Opportunities for self-expression	1st (highest)
Perception of social-physical, environmental interrelationships	2nd
Human problem-solving	3rd
Skill Development	4th
Valuing Processes	5th
(Seven others ranked considerably lower)	-

She observes, "the answers to this item of the questionnaire seem to indicate a great deal of emphasis in the affective domain and is parallel to the objective stated by many of the project personnel" (13). Obviously skill development - which might have a higher cognitive or psychomotor emphasis - is not the central focus. The implications of this finding are quite important. The attitudes, values, beliefs, and preferences of teachers who are involved in interdisciplinary programs are critical. Many programs focus on these affective areas; the whole question of planning involves good working relationships among colleagues, and the teachers' own feelings and beliefs are likely to be transmitted along with other content in interdisciplinary programs just as they are in others.

Teachers who want to focus solely on facts or mechanical skills may succeed in finding a vehicle for these in interdisciplinary exercises or programs. Some attention, however, will have to be given to questions of value and of relevance if the planning is to succeed and if the student is to grasp the importance or value of these facts or skills.

Another set of data which supports the view that technical expertise and interests may not necessarily be the primary qualifications for successful integration into an interdisciplinary approach can be inferred from Table 5. This table (13) presents a summary of the answers to the question:

> "What do you consider to be significant kinds of teacher preparation leading to interdisciplinary teaching of K-6 age children?"

Table 5

Significant teacher preparation for interdisciplinary teaching of K-6 age children

Kind of teacher preparation	Frequency of reply
Creativity in teaching	1st (highest)
Human relationships and sensitivity	2nd
Use of multi-media	3rd
Skills in communication	4th
Techniques of interdisciplinary teaching	(tie,
Understanding of human valuing processes and theories	5th and 6th)
Content areas	7th
Interaction techniques	8th
(five others ranked lower: viz, film-making; theories of learning, etc.)	

These skills suggest that it is the human-ness of the teacher that is most vital to effective interdisciplinary work. It may be argued that these results are limited because the respondents were from elementary arts and humanities programs. Agreed, but what changes would you make to the list with respect to older students (adolescent and beyond) or other types of disciplines?

When the data of Tables 4 and 5 are combined, one can conclude that the individual teacher needs to be interested in the student's values, in his or her own creativity as a teacher, and in the problems of communicating effectively with the student and with colleagues.

2. The Teacher as a Team Member

The teacher who begins to plan interdisciplinary programs with his or her colleagues will be confronted with the same small group problems that befall anyone who joins a team. There will be problems of leadership, problems of responsibility, of record-keeping, of starting and ending meetings, of establishing decision-making procedures, of agreeing to methods of conflict-resolution and a host of other minor ills, aches and pains. But, these occur in every new group; some are more dominant than others, some are more visible than others; some are automatically solved simply by virtue of who agrees to work with whom and who is chosen and who is not. The point of all of this is to explicitly state that interdisciplinary planning is a complex team effort. It is a complex intellectual endeavor and it is achieved through a complex social process.

Something which may help to ease the stress and impact of this process is the material presented in Table 6. This is derived from a review of dozens of studies of small groups in action, ranging from laboratory to natural (real-life) groups and from industrial to psychotherapy groups (16).

Table 6

Developmental Sequence of Small Groups

	Stage			
	Early	Mid		Late
	1st	2nd	3rd	4th
	Forming	Storming	Norming	Performing
Task				
Social				

The conclusion is that the complexity referred to above is a regularly occurring, and highly predictable, set of events. While some groups show more of one stage than another, most appear to show some amount of each stage. These stages can be defined (roughly) as follows:

1. Forming - the group members come together; initial exploration of each other and of the task, the resources, the limits;

2. Storming - a period of disillusionment, frustration, bickering, dissatisfaction with resources, with statements of purpose, aggression towards authorities (present or absent);

3. Norming - agreement on procedures, establishment of working relations, ways of handling new problems worked out, agreement on what will be included or excluded as a concern of the group;

4. Performing - getting the job done, getting along with one another or agreement to disagree, some harmonious relationships begin, sense of pride in work and satisfaction derived from being involved with other group members.

In describing what happens in these four stages, the "task" and "social" levels have been conjoined. Theoretically, it is possible to separate these, and, in most groups, there is development in each level at different rates.

The important feature to note is that whereas some teachers will enter a team because of their interest in the task level (i.e., creating an interdisciplinary program) others will enter the same team because of their interest in team membership (i.e., creating an interdisciplinary program). The first focusses on the product (or output), the second focusses on the process of creating (or on "mixing it up") with colleagues, administrators, and so forth. Further, some have excellent task skills while others possess exceptional social skills. There are problems and rewards at both levels and tolerance of both is absolutely essential.

Many groups fail to survive the Storming stage. This is regrettable, for it is in this stage that the real "snakedown" occurs. A group that works through this phase emerges with the air cleared and with bonds among the participants that can help

the group to resist outside pressures. The sole reason for including this material here is to make the reader aware (or to remind him or her) of the Storming stage and to urge that it be not only accepted but also entered into with gusto when it occurs. Attempts to surpress conflict will lead - ultimately - to the equivalent of industrial sabotage: absenteeism, missed assignments, misplaced materials, resignations at critical times, and bad public relations from within.

Interdisciplinary planning is a complex social event. An outside expert in small group dynamics to act as a process observer/consultant/peacemaker might be worth the cost in large projects. In smaller ones, a conscious recognition and open discussion of these phases when they are observed or in the early planning stages will likely lead to a more productive team.

A fairly tough line on the interpersonal question is seen in the following (2).

> "Teachers should be advised that they are facing the challenge of interpersonal relationships... objections (to the planning being done) will not be broached unless they prove to be founded on factors other than the reluctance of teachers to relinquish some prerogatives or comfortable routines."

One of the early tasks which contributes both to the long range success (Performing) of such planning and also to the short range difficulty (Storming) is the setting of objectives. Chapter 5 will deal with some of the issues encountered in accomplishing this task.

5

OBJECTIVES AND EVALUATION

We engage in teaching activities for a variety of reasons: for professional advancement, because we are assigned a given course, because we love our subject matter and enjoy passing it on to others, because we enjoy the teaching/learning process, because we feel our students need (or want) what we know, and so on. These reasons, and the ways in which we satisfy them can all motivate us to want to engage in "normal" teaching or in interdisciplinary studies. Regardless of the specific reason which lead us to teach in a particular way we can all be challenged with some questions: What are your students supposed to derive from your teaching? Is the process of learning as important as some ultimate skill or knowledge? How should your students feel about your discipline or course material? What should they be able to do at the end of their experience with you which they can't do now?

Like the planning of any type of learning experience, we have a choice with respect to these questions. We can ignore them, or we can face them. If we ignore them we can still go on doing a fine job, enjoying ourselves, turning our students on, and being free-wheeling or creative. In contrast, if we take this set of questions seriously, we frequently may feel mighty uncomfortable.

Our discomfort comes from the fact that as teachers we frequently do not know precisely what we want our students to learn from every exercise or interaction with them. Furthermore, we are not always sure that it's a final outcome in which we are interested. Sometimes we want the luxury (or the pain, or the excitement) of exploring new material. If the school or department will let us, we may even suspend grades and assignments to concentrate instead, on values, attitudes, feelings, and interpersonal behavior in the classroom. Of course, if we are required to teach statistics or elementary mathematics, then our students may suffer in the next class or next year when our "shortcomings" as teachers are discovered through our colleagues' observations of our "graduates."

In planning interdisciplinary studies, many of these questions will become the source of conflict (Storming) in the initial meetings of any team. In reviewing many experiences in course planning, it has been discovered that there are three major sources of friction concerning objectives:

1) Expectations about what one is "supposed" to teach;

2) Assumptions about what the students need to learn;

3) Reservations about the amount of effort required of the teacher and his or her colleagues.

One method of dealing with all of these problems simultaneously is a rigorous attack on the question, "What are your students supposed to derive from your teaching?" To this end, it is suggested that the concept of the "instructional objective" is a very useful one to explore. Note that "instructional" and not "behavioral" objective is used. This is a throwback to a period nearly 15 years ago when Robert F. Mager (11) wrote Preparing Instructional Objectives:

> "Everybody talks about defining educational objectives, but almost nobody does anything about it. Books on education often stress objectives, 'how-to' papers on programming list 'defining objectives' as a first point, and training materials such as films and filmstrips often contain a description of the 'objectives.' But how often are educational units, whether large or small, prepared in response to the questions:
>
> 1. What is it that we much teach?

2. How will we know when we have taught it?

3. What materials and procedures will work best to teach what we wish to teach? (II)"

He concludes this first paragraph of the Foreword to his book with the following:

> "Not only must these questions be answered to instruct effectively, but the order in which they are answered is important. The first question must be answered before the other two."

The remainder of this booklet offers some suggestions as to how to answer Mager's questions.

1. What is it that we must teach?

The word "must" is capable of many interpretations and each should be considered. When you sit down with a group of fellow teachers, administrators, resource people, consultants, or parents, each member of the group may be harboring what turns out to be vastly different assumptions about what must be taught. Here are a few which such a group might produce:

Table 7

What must be taught as seen from five perspectives

The Group Member:	Feels she/he must teach the following:
Other teacher	The "core" concepts of the discipline.
Administrator	Responsibility in curriculum choice.
Resource person	Proper use of media.
Consultant	Newest concepts of procedures
Parents	Value/cost of "frills" or "basics."
and so forth	and so forth

You can, of course, create your own cast and dialogue for such meetings. It is recommended that Mager's question be approached by explicitly dealing with your initial ("gut") responses to "what must be taught?" (Dealing explicitly means something as mundane

as writing reactions on a chalk board of flip-chart so that it can be shared by the whole team.) After doing this, going through the following check-list is recommended; again, recording answers, reserving judgment, noting new sources for the feeling of "must" so that these can be dealt with later.

Table 7

Some responses to "What must be taught?"

1. That which has always been taught - the traditional content of the discipline.
2. That which the student needs in order to do the work of the next year.
3. That which the syllabus says we must cover.
4. That which the student wants to know.
5. That which we feel good about teaching.
6. That which enriches related subjects.

You will be able to extend this list and to obtain reactions by asking group members to literally "brainstorm" the answer to the question. One can assume that there will be a combination of laughter, groans, grunts of assent, and some very surprised expressions.

One reason for suggesting this procedure is that it is not only a warm-up exercise for your planning group, but it is also a good way to get in touch with "Who's really running the show around here?" (Administration? State Ed.? My old University Professor? The Kids?)

A second reason for this assult is to make clear - hopefully - that Mager's question asks us to consider what must we teach - and this is precisely the baseline from which a great deal of course planning starts. It is disastrous in many cases. Why? Because an equally valid question is, "What must be learned?" We all know teachin' ain't learnin'. If planning starts from the learners' needs - academic, social, physical, and so forth, and attempts to recognize these, then the resultant program and exercises are richer, more relevant, more stimulating and more educational in the broadest sense of that word. While the planning meetings are likely to become extremely divergent and wide-ranging when they

start with our students' total learning needs, the stimulus to our own thinking is worth the chaos.

Note here another possible aid to planning. We should be able to say whether what the student needs to learn and what we need to teach fall into one or more of the following categories (1, 4, 5) the A, P, C's of objectives:

1. Affective - feel, value, appreciate

2. Psychomotor - do, make, perform

3. Cognitive - know, recall, evaluate

The differences among these three categories have been dealt with at length elsewhere, as have examples of objectives for each (1, 4, 17). In planning interdisciplinary studies, we need to pay attention to the types of goals or objectives we are going to set. If the student's needs are to know facts, we can specify a cognitive objective; if she/he needs to clarify feelings or values, then we can work out an affective objective, while a need to be able to paint, or to operate a calculator, or use a microscope will involve us in constructing a psychomotor objective.

Thus, in planning interdisciplinary exercises, it is possible to use the methods or concepts or procedures of more than one discipline to achieve several kinds of objectives concurrently. We may design a values inquiry exercise (Affective) around a problem in urban living (Cognitive) and at the same time teach students how to use a coordinate system for plotting pollution (Psychomotor). Objectives in each category or domain can be stated in ways so that they can be independently evaluated. The important fact is that learning may be stimulated and reinforced in three disciplines simultaneously and in three domains concurrently.

2. How will we know when we have taught it?

A not so flippant answer to this is, "We will know we have taught 'it' when our students demonstrate they have learned 'it.'" To repeat: teachin' ain't learnin'. We sometimes forget this.

Evaluation of student performance is an evaluation of teaching. This is even more true in a program in which we collaborate with other teachers to create non-traditional combinations of experiences which we are calling interdisciplinary studies.

A well-stated objective will contain the following:

"1. The statement describes what the learner will be able to do as a result of the learning experience.

2. The essential characteristics of the desired behavior are explicitly stated.

3. The statement clearly specifies the conditions under which the learner will perform the behavior.

Don't quit -- Keep reading. We have good news.

4. The behavior required is within the ability level and the developmental level of the learner.

5. The behavior is observable.

6. The behavior can be evaluated." (5).

What does it mean to say, "The behavior can be evaluated?" It means that one can ask the student a question, or observe his behavior, or read his work (or look at his drawings) in order to compare what he says (or does, or writes, or draws,) with what we hoped he would be able to say, do, and so forth.

The real purist will write objectives and develop observation procedures for every teaching activity. The realist will use the above six points as an agenda for some hard-headed discussion. The team in which you are engaged can move a long way towards creating meaningful programs by considering - as a group - one another's expectations and solutions to these six points. Resource materials are available for assistance with many of the thorny questions of evaluation (1, 4, 11, 17b).

3. What materials will work best?

No simple answer exists to this question, but there is a superb reference to recommend (4). Covert provides a very elaborate system for matching instructional materials to learner needs as indicated by the objectives which have been stated. The most general guideline, but one which has been a very useful one in selecting media and materials for diverse courses includes:

1. Unless materials are being used for entertainment or enrichment, then the simpler they are kept the better.
2. Further, if films or videotapes are used, one should be ready to show how at least 50% of the total presentation is related to the objective.

3. If print (books and magazines, primarily) are used, one should be able to show either that they have specific instructional objectives built into them (and validated through testing)

or

One should be able to point at the specific pages or exercises that are felt to provide answers for the objectives.

4. The teacher is the most flexible medium involved. If she/he sets the objective, she/he is a good source of material, challenges, questions, answers, and reinforcement for the learner.

Interdisciplinary programs demand involvement. Planning for such programs means being all that we are able to be as both teacher and learner.

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